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AJNR Am J Neuroradiol 2014, 35 (2) 386-389

doi: <https://doi.org/10.3174/ajnr.A3683>

<http://www.ajnr.org/content/35/2/386>

This information is current as of April 18, 2024.

Yield of Neck CT and Barium Esophagram in Patients with Globus Sensation

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ABSTRACT

BACKGROUND AND PURPOSE: Globus sensation is common and difficult to treat. The purpose of our study was to compare the diagnostic and therapeutic efficacy of barium esophagram and neck CT in patients with isolated globus sensation, to determine which of these modalities should be preferred in the evaluation of this condition.

MATERIALS AND METHODS: We retrospectively identified patients presenting with isolated globus sensation from January 1, 2005, to December 31, 2012, who underwent neck CT or barium esophagram. We calculated the proportion of patients with abnormal findings, tabulated the nature of the abnormality, and reviewed the medical records to determine whether imaging changed management.

RESULTS: One hundred forty-eight neck CTs and 104 barium esophagrams were included. Five (3.4%) patients with neck CTs and 4 (3.9%) with barium esophagrams demonstrated significant findings related to the history of globus sensation. Of these, 1 (0.7%) neck CT and 1 (1.0%) barium esophagram resulted in a change in clinical management.

CONCLUSIONS: Imaging evaluation of the patient with uncomplicated globus sensation is unlikely to identify clinically significant imaging findings and is very unlikely to result in a change in clinical management, with a combined therapeutic efficacy of 0.8%. Thus, the routine use of imaging in the evaluation of patients with globus sensation cannot be recommended.

ABBREVIATIONS: DE = diagnostic efficacy; GS = globus sensation; TE = therapeutic efficacy

Globus sensation (GS), an intermittent or persistent painless sensation of a foreign body or lump in the throat, is a long-lasting and often frustratingly difficult-to-treat clinical entity.¹ It is a relatively common condition, accounting for up to 4% of new referrals to otolaryngology clinics, with a prevalence of up to 35% in males and over 50% in females, with a relative peak in middle age.²⁻⁴ A range of etiologies has been suggested and described, including lingual and tonsillar hypertrophy, psychogenic factors, cervical osteophytes, upper aerodigestive tract malignancy, thyroid disease, and esophageal motor disorders.⁵⁻⁸ More recently, there has been increasing focus on gastroesophageal reflux disease as a cause of GS.⁹⁻¹³ The myriad potential etiologies of GS have made it difficult to establish standard treatment and imaging strategies for affected patients.

The imaging approach to the patient with GS varies widely in clinical practice. A neck CT, usually ordered with contrast, is well-suited to detect many structural causes of GS and is a useful tool to exclude a large upper aerodigestive tract malignancy, while a barium esophagram is well-suited for detailed evaluation of esophageal motility and mucosal and submucosal lesions of the esophagus. While a barium esophagram may also detect (but cannot exclude) intermittent esophageal reflux, if evaluation for esophageal reflux is of primary concern, then esophageal manometry, endoscopy, esophageal pH monitoring, or a trial of empiric therapy is the preferred diagnostic test.¹⁴⁻¹⁶

The imaging approach to the patient with GS varies widely in clinical practice. Because an evidence-based approach to imaging GS is lacking in current clinical practice, practitioner and locoregional biases strongly influence the decision to use neck CT or barium esophagram. This may adversely impact the clinical value of these studies because the value of a diagnostic test is largely dependent on the prevalence (or the clinician's estimate of the pretest probability) of the target disorder, and abnormalities detectable on neck CT and barium esophagram are statistically unlikely etiologies in a general sample of patients with GS. Because overuse of diagnostic tests contributes to both the rising cost and

Received April 22, 2013; accepted after revision May 31.

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Paper previously presented at: Annual Meeting of the American Society of Neuroradiology and the Foundation of the ASNR Symposium, May 18–23, 2013; San Diego, California.

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<http://dx.doi.org/10.3174/ajnr.A3683>

the overall quality of health care, defining the value of diagnostic tests has become an important goal of health care reform. We conducted the present study to determine the incidence and nature of abnormalities on neck CT and barium esophagram examinations performed in the work-up of patients with isolated GS and to assess which imaging technique contributed most effectively to the clinical management of these patients.

MATERIALS AND METHODS

Patient Selection and Image Acquisition

Our institutional review board approved this study with a waiver of informed consent. All neck CT and barium esophagram examinations included in this study were performed as part of routine clinical care, and the results were retrospectively reviewed.

We searched our enterprise-wide medical records, encompassing 20 academic and community hospitals, in an effort to identify patients with neck CT or barium esophagram studies performed for the evaluation of GS. Radiology reports from January 1, 2005, to December 1, 2012, were searched by using the key words “globus,” “lump in throat,” and “globus sensation.” Neck CT or barium esophagram studies were excluded if performed on patients with a known history of upper aerodigestive or esophageal malignancy (either primary or secondary), lymphoma, prior history of neck, esophageal, or gastric surgery, or palpable abnormality on clinical examination. Demographic data collected included age and sex. Clinical data collected from a retrospective review of the electronic medical record and radiology report included presenting symptom, presentation to the emergency department versus outpatient clinic, specialty of ordering clinician, imaging results, and postimaging clinical management.

Neck CT was performed with 16- or 64-section multidetector row CT scanners (Lightspeed VCT; GE Healthcare, Milwaukee, Wisconsin). CT acquisitions were performed according to standard protocols by scanning from the thoracic inlet to the skull base by using a helical technique with 1.0 pitch, 2.50-mm collimation, 160 maximal mA, 120 kV(peak), and 22-cm FOV. In patients who received contrast, 100 mL of iopamidol (Isovue 370; Bracco, Princeton, New Jersey) contrast material was typically administered by power injector at 1–2 mL per second into an antecubital vein with an 80-second delay before postcontrast imaging commenced (minor variations in the rate and time delay of contrast injection between various sites during the time period of this study were present).

Barium esophagrams were obtained by using a double-contrast technique as biphasic examinations. The studies included upright left posterior oblique double-contrast views of the esophagus obtained with an effervescent agent, sodium bicarbonate/tartaric acid (Baros; Lafayette Pharmaceuticals, Lafayette, Indiana) and a 250% weight/volume high-attenuation barium suspension (E-Z-HD; Bracco Diagnostics, Monroe Township, New Jersey) and prone right anterior oblique single-contrast views with a 50% weight/volume low-attenuation barium suspension (Entrobar; Lafayette Pharmaceuticals). Pharyngeal anatomy was assessed with sequential swallows of low-attenuation barium suspension with the patient in a standing position from multiple projections, by using both video fluoroscopy and cine fluoroscopy, typically set to 4 frames/second.

Esophageal motility was evaluated by having the patient take

multiple (usually 2–5) separate swallows of low-attenuation barium while in the prone right anterior oblique position, with the radiologist evaluating the progression of primary esophageal peristalsis from the thoracic esophagus through the gastroesophageal junction during the real-time examination. At the end of the study, the patient was rotated to the supine and right lateral positions for assessment of spontaneous gastroesophageal reflux; provocative techniques including the Valsalva maneuver were performed at the discretion of the radiologist.

Diagnostic and Therapeutic Efficacy

To determine the value of neck CT and barium esophagram in the work-up of GS, we used the 2 categories of efficacy as defined by the American College of Radiology Committee on Efficacy.¹⁷ Diagnostic efficacy (DE) is the number of studies with a new or progressive major finding divided by the total number of studies and is an indicator of the value of the study in assisting in a diagnosis. Therapeutic efficacy (TE) is the number of studies resulting in a change in clinical management divided by the total number of studies and is an indicator of the influence on patient clinical management.

Data Analysis

Confidence intervals for proportions in the demographic data and for therapeutic and diagnostic efficacy were calculated for pertinent imaging findings by using a continuity correction.¹⁸

RESULTS

Patient Selection and Image Acquisition

One hundred fifty-nine neck CTs and 110 barium esophagrams performed for GS were initially evaluated. Among patients with neck CT studies, 5 were excluded for a palpable abnormality on clinical examination, 1 was excluded due to a history of Burkitt lymphoma involving the neck, 1 was excluded due to a history of prior lung cancer with esophageal invasion and erosion, and 4 were excluded due to prior surgery involving the neck (thyroglossal duct cyst removal and vocal cord polyp removal) or esophagus (prior Nissen fundoplication in 2 patients). Among patients with esophagrams, 5 were excluded due to a history of neck (thymoma), esophageal (Nissen fundoplication, repair of paraesophageal hernia, prior esophageal web with multiple dilations), or gastric (prior gastrojejunostomy) surgery, and 1 was excluded due to a history of tonsillar carcinoma. The remaining 148 neck CTs, of which 140 (94.6%) were contrast-enhanced, and 104 barium esophagrams were included in our study. Five patients had both a neck CT and barium esophagram in the timeframe of the study and were included within both groups. Demographic and clinical characteristics are summarized in Table 1.

Slightly less than half of the neck CTs were ordered by otolaryngologists. Slightly more than half of the esophagrams were ordered by primary care physicians. The specialties of ordering physicians are shown in Table 2.

Diagnostic and Therapeutic Efficacy

Four of the 104 barium esophagrams (DE, 3.9%; 95% CI, 1.5%–9.5%) demonstrated previously unknown clinically important findings in the evaluation of GS. Two revealed mild indentation of

Table 1: Patient demographics and clinical characteristics

	Neck CT	Barium Esophagram	Total
No. of patients	148	104	252
No. of males (%)	55 (37)	63 (61)	118 (47)
Age (yr) (mean, range)	55 (18–91)	55 (17–91)	55 (17–91)
Emergency setting (%)	22 (15%)	3 (3%)	25 (10%)
Diagnostic efficacy	5 (3.4%)	4 (3.9%)	9 (3.6%)
Therapeutic efficacy	1 (0.7%)	1 (1.0%)	2 (0.8%)

Table 2: Ordering clinicians by specialty

	Neck CT (%)	Barium Esophagram (No.) (%)	Total (%)
Otolaryngology	70 (47)	31 (30)	101 (40)
Gastroenterology	10 (7)	11 (11)	21 (8)
Internal medicine/primary care	40 (27)	58 (56)	98 (39)
Emergency department	22 (15)	3 (3)	25 (10)
Other ^a	6 (5)	1 (0.9)	7 (3)

^a Each ordering 3 or fewer studies: General Surgery, Orthopedic Surgery, Geriatrics, Hematology-Oncology, Rheumatology.

the posterior esophagus from cervical spondylosis, 1 revealed minimal narrowing of the distal esophagus, and 1 revealed marked esophageal dysmotility with a suggestion of a distal esophageal stricture. Only the study revealing minimal narrowing of the distal esophagus was documented to have changed clinical management (TE, 1.0%; 95% CI, 0.2%–5.2%), with the patient eventually receiving pneumatic dilation of a benign esophageal stricture on subsequent endoscopy, with resulting resolution of his or her GS. The patient with marked dysmotility and suggestion of a distal esophageal stricture had normal endoscopic examination findings.

Five of the 148 neck CTs (DE, 3.4%; 95% CI, 1.5%–7.7%) demonstrated previously unknown major findings in the setting of a GS work-up. One demonstrated thickening of the upper third of the esophagus, 1 revealed questionable abnormal enhancement of the larynx, 1 showed an infected thyroglossal duct cyst, and 2 demonstrated hypertrophy of the lymphoid tissue of the Waldeyer ring. Of all neck CT studies, only the study demonstrating an infected thyroglossal duct cyst was documented to have changed clinical management (TE, 0.7%; 95% CI, 0.1%–3.7%). The 2 patients with hypertrophy of the lymphoid tissue of the Waldeyer ring on CT had negative flexible laryngoscopic examination findings, while the patient with thickening of the upper third of the esophagus had negative flexible laryngoscopic and esophagogastroduodenoscopy study findings. This last patient's GS was thought to be secondary to depression and resolved approximately 1 year after the abnormal CT finding. The patient with questioned abnormal enhancement of the larynx had a flexible laryngoscopic examination that revealed mild interarytenoid erythema and edema attributed to laryngoesophageal reflux, for which the patient had already started treatment.

When we considered both types of imaging studies together, the overall diagnostic efficacy of imaging in patients with GS was 3.6% (95% CI, 1.9%–6.7%), while the overall therapeutic efficacy was 0.8% (95% CI, 0.2%–2.8%).

Of the studies with previously unknown major findings, 4 were ordered by otolaryngologists (DE, 0.040; 95% CI, 0.016–0.097), 4 were ordered by primary care physicians (DE, 0.041;

95% CI, 0.016–0.100), and 1 was ordered by an emergency department physician (DE, 0.040; 95% CI, 0.007–0.195). Of the studies that changed management, 1 was ordered by an otolaryngologist (TE, 0.010; 95% CI, 0.002–0.054) and 1 was ordered by a primary care physician (TE, 0.010; 95% CI, 0.002–0.056).

DISCUSSION

The purpose of this study was to compare the diagnostic and therapeutic efficacies of barium esophagrams and neck CTs in the evaluation of GS. Our results indicate that the diagnostic and therapeutic efficacy of imaging GS with either of the 2 modalities is extremely low. Unsuspected abnormalities were found in <4% of patients, and less than half of those induced a change in clinical management.

Imaging plays a role in the evaluation of GS in those patients with a known history of upper aerodigestive or esophageal malignancy (either primary or secondary); lymphoma; history of neck, esophageal, or gastric surgery; or palpable abnormality on clinical examination; thus, the importance of a careful and detailed history and physical examination cannot be overstated. On the basis of the findings of this study, however, we cannot endorse the routine use of imaging—with barium esophagram or neck CT—in the evaluation of the patient with GS without these modifying risk factors.

There is no consensus on the diagnostic approach to the patient with GS. Most practitioners will combine a detailed history and physical examination, with special attention to symptoms suggestive of upper aerodigestive tract malignancy—such as dysphagia, odynophagia, weight loss, and hoarseness—gastroesophageal reflux, or potential psychological history, and physical examination of the neck.^{6,7} Some authors advocate routinely prescribing antireflux medications,¹⁹ while others favor the routine use of nasolaryngoscopy²⁰; still others advocate the use of various radiologic modalities to evaluate GS.^{21,22}

In the past, many otolaryngologists advocated the routine use of rigid endoscopy in patients presenting with GS. Endoscopy for GS accounted for >7% of all endoscopy cases during a 12-month period in 1 review²³; however, recent articles have questioned the limited added value provided by rigid endoscopy in light of its associated risks (both of the procedure and accompanying anesthesia), costs, and patient discomfort and have suggested that an outpatient transnasal fiberoptic flexible endoscopic examination be used instead.^{7,20,23,24}

Reliance on imaging may be, at least in part, driven by a fear of missing a potentially treatable aerodigestive tract malignancy. Despite concern that this potentially life-threatening disease may at times present with isolated GS, our results confirm those of multiple prior studies in which no pharyngeal or esophageal malignancy was found in patients presenting with GS and undergoing a barium esophagram.^{20,25–27} Furthermore, our study identified no cases of pharyngeal or esophageal malignancy in patients presenting with isolated GS and undergoing neck CT.

Given the potential psychosocial component underlying GS, it may be argued that a negative finding on an imaging study could be reassuring to the patient and play a role in improvement or resolution of clinical symptoms. While it would be difficult to undertake an evidence-based assessment of such a treatment

model, given the current focus on efficient and economic use of limited health care resources, we cannot endorse the routine use of a study that will almost never yield positive findings.

We would also caution that overuse of imaging for clinical symptoms such as GS that lacks correlation with an identifiable radiographic finding will inevitably lead to discovery of incidental findings with a high prevalence in the general population and without a strong link to the clinical entity that led to imaging. In the setting of a symptom such as GS whose underlying mechanism is poorly understood, such incidental findings are of unknown clinical significance and, once demonstrated on imaging, may lead to overtreatment of patients. In our study, as in previous studies,^{26,27} many otherwise asymptomatic abnormalities such as small hiatal hernias, mild gastroesophageal reflux, and esophageal dysmotility, with a high prevalence in the general population and without a strong link to GS, were demonstrated.

The principal limitation to our study is the relatively large number of exclusion criteria used. Given that patients presenting with GS may have a history of prior head and neck or gastric conditions, one may argue that our results are applicable to only a small subset of patients presenting with GS. However, our exclusion rate of <7% does not suggest that this would affect our overall conclusion. A second limitation is the relatively small number of patients in our study, especially given the 7-year timeframe during which the study was conducted. If anything, this would suggest that clinicians in our academic hospital system are more selective than average when requesting imaging, lending more credence to our findings. Additionally, our study is retrospective in nature. While we may infer that studies with no significant findings did not affect clinical management, it is impossible to know whether clinical management would have been the same in the absence of a negative imaging study or a different work-up pathway would have been followed without the reassurance that a negative imaging report brings.

CONCLUSIONS

Imaging evaluation of patients with uncomplicated GS is unlikely to identify a clinically significant imaging finding and is very unlikely to result in a change in clinical management, with an overall therapeutic efficacy of 0.8%. Thus, the routine use of imaging in the evaluation of patients with uncomplicated GS cannot be recommended.

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